

SOLAR OBSERVATIONS

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SOLAR RADIATION OBSERVATIONS, JANUARY 1938

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Measurements of solar radiant energy received at the surface of the earth are made at eight stations maintained by the Weather Bureau, and at nine cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory of Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison. Measurements of the intensity of direct solar radiation through Schott color filters, for the determination of atmospheric turbidity and precipitable water vapor, are conducted at Washington and Blue Hill.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording Eppley thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian Silver Disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 8 a. m. (seventy-fifth meridian time) and at noon (local mean solar time).

During January 1938 direct solar radiation intensities averaged below normal at Washington and Blue Hill, and very slightly above normal at Lincoln. So few observations were taken at Madison that the departures from normal for that station are meaningless.

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of an Eppley pyrheliometer recording on either a microammeter or a potentiometer.

During January 1938 all stations show a deficiency in the total solar and sky radiation for the month with the exception of New York, Fairbanks, New Orleans, Riverside, Blue Hill, San Juan, and Friday Harbor. It is interesting to note that with the exception of the Alaskan station, all the stations with plus departures are located near the coasts.

For the determination of atmospheric turbidity and precipitable water, the intensity of direct solar radiation at normal incidence is measured, with and without color filters, by a thermopile recording on a potentiometer. The publication of table 3 is temporarily suspended, during a reinvestigation of the transmission of the filters.

No polarization measurements were made at Madison during January owing to continual snow and ice cover. The polarimeter at Washington has recently been overhauled and observations at this station will begin again when the instrument is installed within a short time.

TABLE 1.—Solar radiation intensities during January 1938

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.											
Date	Sun's zenith distance										Local mean solar time
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	
	75th mer. time	Air mass									
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Jan. 3.	2.62	0.64	0.84	0.99				1.00			2.74
Jan. 4.	3.81							1.06			3.63
Jan. 5.	3.81	.86	1.12	1.27				1.25	0.95		3.45
Jan. 6.	3.45	.75	.81	.88							3.99
Jan. 13.	2.87		.66	.76							2.74
Jan. 20.	2.36	.32	.40	.54							2.74
Jan. 25.	7.29			.84							4.37
Jan. 27.	1.24			1.02							1.32
Jan. 29.	1.37	.59	.70	.95							2.06
Means		.63	.76	.91				1.10	(.95)		
Departures		-.11	-.10	-.11				-.01	-.14		
MADISON, WIS.											
Jan. 27.	0.79				1.54						0.79
Jan. 31.	.74		1.11								.64
Means			(1.11)		(1.54)						
Departures			+ .05		+ .18						
LINCOLN, NEBR.											
Jan. 1.	2.06	1.06	1.19	1.37			1.50	1.32			2.49
Jan. 3.	3.15						1.49	1.34		1.12	1.24
Jan. 4.	1.12	1.05	1.15	1.30							2.49
Jan. 5.	1.68				1.56						2.74
Jan. 7.	.81	1.06	1.16	1.32	1.55			1.41	.94		.86
Jan. 8.	.86	1.00									1.02
Jan. 12.	2.36							1.35	1.23	1.07	2.26
Jan. 14.	2.26						1.51				2.16
Jan. 22.	3.81	1.00	1.11	1.22	1.36			1.23	.98	.92	4.95
Jan. 25.	.79	.92		1.20				.79	.60	.40	.56
Jan. 26.	.86				1.56						.79
Jan. 27.	1.37	1.05	1.14	1.31	1.49		1.50	1.28	.88	.72	1.07
Jan. 28.	1.96	.89	1.02	1.19	1.35		1.15				2.74
Jan. 30.	.86						1.43	1.34	1.21	1.10	.66
Jan. 31.	.58	1.01	1.14	1.24	1.44						.79
Means		1.00	1.13	1.27	1.47		1.43	1.25	1.03	.92	
Departures		+ .08	+ .08	+ .07	+ .08		+ .02	+ .07	-.02	-.01	
BLUE HILL, MASS.											
Jan. 3.	2.9	0.99	1.06	1.13	1.19	1.31	1.19	1.13	1.07	1.01	2.3
Jan. 6.	2.9	.68	.77	.89	1.01						3.8
Jan. 8.	2.9			1.02	1.30		1.00	.88	.77	.66	2.9
Jan. 9.	1.5	1.00	1.09	1.15	1.29		1.28	1.08	.90		1.5
Jan. 12.	1.3	.98	1.07	1.14	1.24						2.6
Jan. 15.	1.7				1.18		1.14				1.7
Jan. 16.	1.1		.97	1.18	1.43						1.4
Jan. 18.	1.1			1.26	1.20						1.0
Jan. 19.	.7	1.17	1.28	1.40	1.40		1.32	1.19			1.1
Jan. 26.	2.0	.85	.95	1.08	1.22						2.0
Jan. 27.	1.5	.76	.86	.97	1.13						1.5
Jan. 28.	1.3		1.02	1.08	1.43		1.43	1.25	.92		1.3
Jan. 29.	1.4		.85	.95	1.11						1.6
Jan. 30.	3.2			.72	1.00		.99	.98			4.6
Means		.92	.99	1.07	1.22	1.31	1.19	1.08	.92	.84	
Departures		-.01	-.03	-.06	-.08		-.13	-.09	-.13	-.10	

*Extrapolated.